


How Glosses in Academic Texts are being Read?

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Abstract: A gloss refers to a short definition or explanation of the meaning of a word in a text that can assist learners in reading comprehension and vocabulary learning. This study aims to investigate how glosses in English academic texts affect the reading behaviour of ESL undergraduates while reading is taking place. In addition, it also examines the effects of gloss on the learning of the glossed target words. Twenty ESL first year undergraduates who were grouped into proficient and less proficient learners based on their MUET (Malaysian University English Test) results participated in a reading experiment using the eye tracking device. Eye movement data (i.e. fixation duration and scan path) obtained from the eye tracker, retrospective interviews and three vocabulary tests were analysed. The glossed target words were selected from Coxhead's Academic Word List (AWL) and were placed in the same line with the target word in the texts, in right margin of the texts. Eye movement analyses showed that the position of the gloss either at the top, middle, or bottom of the page influences how and when participants read the gloss. Participants who read the gloss before or after reading the texts were high unlikely to regress to the text to infer to the target words in the text. However, participants who read the gloss while reading the text mostly regressed to the text and read the target words in the text. The fixation duration data revealed that proficient participants looked at more glosses than the less proficient participants. The retrospective interview confirmed the fact that the participants did not read the gloss in each encounter as they have become familiar with the target words in the gloss. Nonetheless, they agreed that the presence of glosses in the texts helped them to learn unknown words, particularly in noticing the form of the words. The finding suggests that the use glosses need to be emphasized in language teaching and learning, particularly in reading comprehension and vocabulary learning.

Keywords: gloss, eye movements while reading, vocabulary learning, reading academic text

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Introduction

By having a robust vocabulary, learners can grasp ideas and concepts better, which will positively affect their academic achievement. Therefore, learning a word is important for the receptive use (listening and reading) and the productive use (writing and speaking) of language. In the academic context, vocabulary knowledge plays a vital role to facilitate learning. University students need to equip themselves with sufficient vocabulary knowledge for them to read and fully understand academic material independently (Laufer & Ravenhorst-Kalovski 2010; Rahman, Yap, & Darmi 2018) to achieve academic success. In addition, one of the ways to

expand learners' vocabulary through reading is by modifying the reading input so that it becomes more informative to the meaning of the target word, thereby facilitating the lexical inferencing process (Godfroid, Boers, Housen 2013). Modification of input (i.e., target words) such as input enhancement can be done through the use of gloss, manipulation of frequency of exposure, and the presentation of contextual information for the target words. Such enhancement can increase the saliency of the target words so that they will be noticed and are more likely to be acquired by learners.

A number of studies have investigated the effects of different types of input enhancements on incidental word learning from reading, for example, repeated exposures (Teng 2016; Godfroid et al. 2017; Mohamed 2017), contextual clue (Webb 2008), and gloss (Boers et al. 2017; Jung 2016; Ko 2012), to name a few. Glosses refer to the definition of meaning, synonym, or translation that is provided for a target language item, to facilitate reading comprehension. Rather than modifying a text which may affect the authenticity of the text, glossing can be used to modify the input to resolve lexical difficulty, and assist readers to understand the text better. However, the findings were inconclusive on the effects of glosses on reading comprehension and target word learning as glosses tend to be skipped most of the times. Hence, this study investigates how glosses in English academic texts affect the reading behaviour of ESL undergraduates while reading is taking place.

Gloss in Reading

Many studies in gloss studies examined the effect of different types of glosses on learning outcomes such as vocabulary acquisition or reading comprehension. The common ground of these approaches is that it helps to flag target language input so that learners can allocate their attention to the form and meaning constructions of target words while they read for the purpose of meaning comprehension (Godfroid & Uggen 2013). However, the modification of input does not guarantee the retention of target words.

Glosses refer to the definition of meaning, synonym, or translation that is provided for a target language item, to facilitate reading comprehension. Various input in the form of glosses have been investigated and compared, such as the use of first language (L1) versus second language (L2) in glosses (Ko 2012; Vela 2015; Ertürk 2016), the translation of target words in L1 (Rott 2007; Jung 2016), and the use of definition or synonym of the target word in L2 (Guidi 2009; Nowzan & Baryaji 2013; Gossens, Camp, Verkoeijen, & Tabbers 2014), just to name a few. In addition, the type of glosses also differs across the studies: computerised versus paper based glosses (Bowles 2004), multimedia glosses (Hulstijn & Laufer, 2001; Guidi 2009; Boers, Warren, He, & Deconinck 2017), computer mediated gloss (Hu, Vongpumivitch, Chang, & Liou 2014; Marefat, Rezaee & Naserieh 2016), and multiple choice glosses (Hulstijn 1992; Rott, William, & Camero 2002; Duan 2018). In addition to the different input and types of glosses investigated across the studies mentioned above, the methods of L2 vocabulary learning assessment employed in these studies also vary, such as multiple-choice vocabulary test, meaning recall in L1, cloze tasks, and meaning recall in L2 to measure the form and meaning construction of the target words learned.

Another noteworthy difference seen across these studies is in terms of glossing condition, whereby several studies boldfaced the target word in the text (Ko 2012; Ertürk 2016; Danesh & Farvardin 2016; Warren et al. 2018; Duan 2018) while a few other studies did not bold the target word in the text (e.g. Boers et al. 2017; Jung 2016). Bolding may increase the chances for learners to notice the target word. However, boldfacing the target word in the text does not guarantee that it will attract readers' attention to read its iteration in the gloss (Warren et al. 2018). In a nutshell, the divergent of methodological approaches to glossing employed by these studies highly contribute to inconclusive findings in the effects of glosses on L2 vocabulary learning.

When reading for comprehension, readers probably dismiss unfamiliar words, or in other case, they might incorrectly infer the meaning of those unfamiliar words. In both cases, the learning of those unfamiliar words is highly unlikely to happen. According to Ko (2005), the use of glosses for unfamiliar words in the text will prevent learners to make wrong guessing and in doing so, it will ease the reading process itself. Moreover, glosses increase the opportunity for learners to read the target words more than once (Watanabe 1997). After the learner read the target word in the text, he/she would probably read the target word in the gloss, and probably go back to the text and read the target word again. The provided meaning plus repeated encounter of the target word would enhance incidental learning of the word. A considerable amount of past studies have shown that, overall gloss has a positive effect on vocabulary learning, compared to no gloss condition (Watanabe 1997; Ko 2012; Danesh & Farvardin 2016; Jung 2016; Duan 2018). However, the contradicting notion that gloss might deprive the learner's mental effort to search and infer the meaning of the word may cause in a less affirmative result on vocabulary learning (Huang & Lin 2014).

In addition, with regard to the effects of the different types of glosses, such as multiple-choice gloss, pictorial glosses, and computer-mediated glosses, the findings vary; for example, the findings of Boers et al.s (2017) study on the effects of multimodal glosses over text-only glosses on L2 vocabulary learning. In their study, two groups of participants read a narrative text containing six pseudo words glossed with textual information or textual information plus a picture. The study found no significant difference between the two glosses, claiming that picture may hamper participants' initial uptake of word form and meaning. This is evident in the results from three vocabulary tests posed to the participants, in which gloss with picture group showed the poorest performance in almost all the three tests (i.e., meaning recognition, form recall, content questions). The use of gloss is beneficial as it may compensate the lack of contextual input; however, this may diminish reader's chance to infer and hence reduce the effort in processing, which might affect the retention in long term memory (Watanabe 1997).

On the other continuum, one might suggest that new words will be effectively and efficiently learnt by making learners infer the meaning of unknown words using the information obtained from context (Hulstijn 1992). Burcu Varol and Gülcan Ercetin (2019)'s study investigated the effects of gloss type, position, and working capacity on second language comprehension in electronic reading. The findings demonstrated that the effects of gloss content rely on the type of task used to facilitate comprehension, while the effects on gloss position were still ambiguous. The main effect of the gloss position was significant in pop-up conditions compared to separate

window conditions in terms of frequency of access. Ko (2012)'s study investigated the effect of gloss and no gloss texts on L2 vocabulary learning. The findings demonstrated there was significant differences between glossed and no glossed conditions on L2 vocabulary learning. The result from a survey of the study revealed that participants preferred glosses in their reading materials and they looked at the gloss when they came across unknown words with the purpose to understand the text. While Ko's study only examined the effect of glosses on vocabulary learning, Jung (2016)'s study investigated how glossing in L2 texts affect learners' reading comprehension, L2 grammar and vocabulary learning. The results indicated that glossing significantly facilitated learning of the target constructions while having no influence on reading comprehension scores.

Many studies on glossing employed pre-test and post-test to investigate the effect of glossing on learning outcomes (Ko 2012, Vela 2015, Jung 2016, Boers, Warren, He & Deconinck 2017). Only a few utilised eye tracking and investigate the effect of glosses on reading behaviors and learning outcomes (Warren et. al). However, these studies do not address how glosses are being read and process specifically. Jung and Révész (2018) and Warren et. al (2018) were among the latest studies on glossing the used eye tracker as a research tool. Warren et. al (2018)'s investigated the effect of gloss types on learners' intake of new words. The findings showed that glosses have little effect on the distribution of attention (based on fixation duration) and gloss with definition and picture yielded better result in form and meaning recognition of the target word, while text only gloss tend to be skipped most of the times. On the whole, glossing has been found to facilitate vocabulary learning and ease reading comprehension. Nonetheless, different assessment methods and types of glosses investigated may entail different outcomes.

Methodology

Participants

A total of 20 first year Malaysian ESL undergraduates at a research university in Malaysia were chosen as participants for this study. All participants had received similar number of years of English language education before entering university, and attained Band 3 or Band 4 for the Malaysian University English Test (MUET) results. They were in the same field of study (i.e. social science) but from two different academic specialisations for their bachelor's degree programme namely, Bachelor of Social Science in Psychology and Bachelor of Education in Teaching English as a Second Language (TESL). To ensure the similarity in terms of familiarity and knowledge of the structures of the academic text, the participants chosen were those had not taken any preparatory courses related to English for Academic Purpose (EAP). Hence, they had not been formally taught the structure, types, and the language skills associated with academic discourse. The data of these participants were derived from a larger sample of participants which consisted of 41 participants from the TESL programme and 38 participants from the Psychology programme. All of the participants underwent the same research procedure set by this study. However, to gain more information regarding the reading processes involved when reading English academic texts, data (i.e. total fixation duration, analysis of scan paths, retrospective interview) were elicited from 20 participants, 10 from each undergraduate programme, for a detailed analysis.

Reading Materials

Three academic texts (labelled as Text A, Text B, and Text C) were adapted from the introduction section of three journal articles. The introduction section of a journal is deemed suitable to be used as a stimulus (reading material) for this study as the section generally provides relevant information about the topic and does not usually contain any methodological terms that may be unfamiliar to the participants. Since content familiarity eases reading comprehension (Pulido 2004), the content of journal articles was carefully selected to ensure that the participants will be able to understand the texts. The fact that the participants were from the social sciences and humanities cluster, the journal articles chosen were on research in social sciences and humanity, and are related to university students in general. The texts were on workplace writing, technology in education and skills among graduates. Each text had four paragraphs and each paragraph was displayed on a single screen. Glosses of four academic words were inserted on the right margin of the text. The glosses were placed in a box with blue outline, in line with the academic word in the text. The target words in the glosses were chosen from the least known academic words by ESL undergraduate students based on a study conducted by Sulaiman, Salehuddin and Khairuddin (2018). The words were derived from Academic Wordlist (AWL) by Coxhead (2000).

Instruments

The current study used TOBII TX300 Eye Tracker to investigate the participants' eye movement patterns (namely their fixation duration, fixation counts, reading time, and scan path) when reading academic texts. The eye tracker has a sampling rate of 300 Hz and a large head movement box which enables less restricted movements and more natural position for the respondents. The heat map displays the participant's degree of attention on certain stimuli. Areas that receive longer fixation durations or a higher number of fixations known as the "hot" zones are highlighted with warm colours (e.g., red), whereas areas that receive shorter fixation durations or fewer number of fixations known as the "cool" zones are highlighted with colder colours (such as green), and no colour reflects areas of no looks or no fixations (Conklin & Pellicer-Sanchez 2016).

Scan path is another form of visualization that encloses fixation positions that tells the sequence of the eye movements while looking at the stimuli. The numbering in the circle indicates the sequence of fixation and the line indicated the direction of the eye movement. The scan paths can be exported as image files or as animated visualization that show the recording of the participants from the integrated camera and speaker. The three academic texts were presented on a computer screen in regular Consolas font, size 18, double spaced. Each text consisted of four displays; each display contained 10 to 12 lines of text. A total of 12 displays were presented to the participants. In addition, to support the data obtained from the eye tracker, a retrospective interview was conducted on each participant right after they completed reading the three texts. The questions asked on the participants' comprehension of the texts that they have read, their reading behaviours (based on scan path recording) and the text in general.

Findings and Discussion

Ten participants from the high proficiency group were labelled as H1 to H10, while ten participants from the low proficiency group were labelled as L1 to L10. All three texts consisted of gloss of four target words namely, 'confer', 'albeit', 'amend', and 'notion'. The words 'confer' and 'amend' appeared three times whereas the words 'albeit' and 'notion' appeared four times throughout the three texts. Table 1. presents the number and position of the gloss for each page in each text. The glosses provide meaning of the target word. The gloss of the target academic words appeared on the right-side margin of the screen. The gloss was placed in a box with blue outline, in line with the target word in the text. The number of glosses varies per screen, from zero to three.

Table 1. Number of gloss on each page

Text(Page)	Number of Gloss	Position of gloss on page
Text A (1)	1	Bottom
Text A (2)	2	Top, bottom
Text A (3)	-	-
Text A (4)	1	Top
Text B (1)	-	-
Text B (2)	3	Top, middle, bottom
Text B (3)	1	Middle
Text B (4)	1	Top
Text C (1)	1	Top
Text C (2)	2	Top, middle
Text C (3)	1	Bottom
Text C (4)	1	Bottom

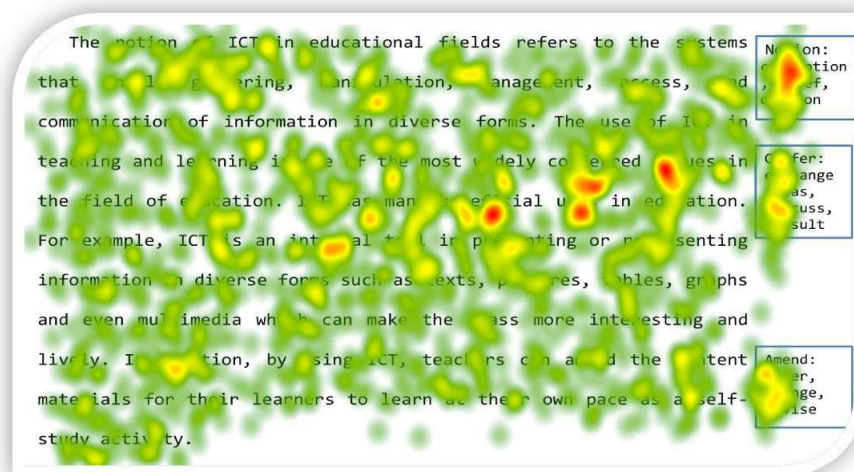


Figure 1. Sample of Heat Map

encountered while reading the passage. The second page of Text B which consists of three glosses also resulted in high percentages of glosses looked-up among the participants from both groups.

Table 2. Percentage of looked-up glosses on each page

Text (Page)	% of Glosses Looked-Up	
	Proficient	Less Proficient
Text A (1)	90%	100%
Text A (2)	60%	60%
Text A (4)	60%	50%
Text B (2)	90%	70%
Text B (3)	80%	50%
Text B (4)	70%	50%
Text C (1)	50%	30%
Text C (2)	70%	60%
Text C (3)	60%	40%
Text C (4)	40%	50%

Regarding of percentage of glosses referred as seen in Table 3., more than half of the participants from both groups looked at more than 70% of the total glosses provided. Three out of the ten participants from the less proficient group looked at less than 50% of the total glosses provided. Among the three participants, two participants only referred to two out of fourteen glosses provided in all texts. A similar pattern was seen in one proficient participant who only read two out of the fourteen glosses.

Table 3. Number of participants based on percentage of glosses looked-up

% of Glosses Looked Up	Number of participants	
	(Proficient)	(Less Proficient)
90-100	3	2
70-89	3	4
50-69	3	1
30-49	-	1
0-29	1	2

H6 was one of the proficient participants who looked at more than 90% of the glosses provided. Based on his/her scan path, H6 read the target word and the definition for all the glosses on Text A; however, she/he only looked at the rest of the glosses on other texts and merely read the target word. Nevertheless, H6 was able to recognise two out of the four target words in the gloss condition and successfully provided the meaning of three of the target words. Based on the interview transcript, H6 stated that she/he knew the meaning of the target words presented in the glosses and did not have to read the definition provided in each gloss thoroughly.

In the same vein, H8 who looked at all of the glosses was able to successfully recognise all four target words and provided the meaning of two target words correctly. During the retrospective interview, H8 asserts that she/he read the glosses after reading the text. This is in accordance with H8's scan path which revealed that he/she read all of the glosses after she/he had read the text on that page and did not go back to the passage. When H8 was asked why he/she referred to the gloss after reading, H8 said that *"because I want to know the gist of the text first, and then, I only refer...to the definition"*. Besides that, H2, who looked at more than 70% of the glosses, was able to recognise and recall the meaning of all the target words placed in the glosses. Based on H2's scan path and interview, it was apparent that H2 read the target word and the definition in the glosses while reading the passage. H2 went back to the passage to reread the lines that contained the target words in some of the glosses. Nevertheless, in some cases, a high percentage of glosses looked up does not necessarily lead to better recognition of target words. For instance, H7 has the least percentage of glosses looked up among proficient participants. However, he/she was able to recognise all of the target words and recalled the meaning of one target word. H7 stated that *"if I couldn't understand one word..i will refer to the gloss..then I just go back to the sentence...and start to reread"* indicating that he/she only refer to the gloss if there are words whose meaning he/she did not know.

On the other hand, L1 who only looked at one gloss (7.1%) while reading the texts failed to recognise any of the target words. In his/her retrospective interview, L1 asserted that he/she would search for the definition of unknown words if the content of the text is difficult to understand. L1 further added that he/she would reread the contents of the text or guess the meaning of the unknown words. The findings also revealed that the position of the gloss influenced how the participants read the gloss. According to Ko (2005), using glosses for unfamiliar words in the text will prevent learners from making wrong guesses and, in doing so, will ease the reading process. This was reflected in the current study, whereby, those who looked at the glosses while reading were better at recognising the target words and recalling the meaning of the target words compared to those who read the glosses after they have read the text. Even though, the participants did not fixate on the gloss in each encounter, they still agreed that gloss helped to know the meaning of unknown words. This is probably due to the fact that they have grasped the meaning of the words presented in the glosses and chose to ignore it in the following texts. Nonetheless, all the participants agreed that glosses had assisted them to cope with unfamiliar words while reading, and this corroborates the claim made by Duan (2018), Jung (2016), Ertürk (2016), and Ko (2012). However, it may not warrant comprehension of the text in general and target word learning in specific.

Conclusion

The use glosses need to be emphasized in language teaching and learning, particularly in reading comprehension and vocabulary learning. In addition, the findings revealed the provision of different input enhancements in reading material that can be adapted for second language vocabulary learning and teaching. Gloss has shown to enhance the noticeability of target words that leads to successful form recognition of the words among participants in the current study regardless of their language proficiency. The use of typographic enhancement

such as highlighting or bolding the target words in the passage could also increase the chances of deeper processing of the target words among participants. Vocabulary learning in the present study varies depending on input enhancement of academic target words and the participants' language proficiency. Therefore, language instructors should take into consideration these

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